

WE CLAIM:

1. A method for producing an iron-based Fischer-Tropsch catalyst composition in a precipitation reaction, wherein Fe(III) ions in solution are reduced to Fe(II) thereby increasing the Fe(II)/Fe(III) ion ratio, prior to the precipitation of the catalyst.
2. The method according to claim 1, wherein the Fe(III) ions are reduced to Fe(II) by the introduction of a reduction agent to the solution.
3. The method according to claim 1 or 2, wherein the reduction agent is oxalic acid or formic acid.
4. The method according to claim 3, wherein the reduction agent is oxalic acid.
5. The method according to claim 4, wherein the mole ratio of oxalic acid to Fe(III) is 0.4 or greater.
6. A method for preparing an iron-based catalyst pre-cursor including the following steps:
 1. preparing a first solution in a polar solvent, the solution containing Fe(III) ions and reducing Fe(III) ions to Fe(II) ions;
 2. adding a precipitation agent to the solution to form a catalyst precipitate;
 3. washing the precipitate;
 4. drying, typically spray-drying, the washed precipitate; and
 5. calcining the dried precipitate.

7. The method according to claim 6, wherein the first solution is formed by dissolving a ferric salt in the polar solvent.
8. The method according to claim 7, wherein the ferric salt is Fe nitrate.
9. The method according to any one of claims 6-8, wherein the Fe(III) ions are reduced to Fe(II) ions by introducing a reduction agent into step 1.
10. The method according to claim 9, wherein 40% or more reduction agent, calculated in terms of Fe(III), is included in the first solution in step 1.
11. The method according to claim 10, wherein the reduction agent is oxalic acid or formic acid.
12. The method according to claim 11, wherein the reduction agent is oxalic acid.
13. The method according to claim 6, wherein the ions of structural promoters including Mn, Cu, Zn, Cd, Ni, Co, Al and chemical promoters including Zn, Mg, Cu, Cr, Ru, Pd, Rh or and alkaline or alkali earth metals including K, Na and La are included in the first solution.
14. The method according to claim 13, wherein the first solution in step 1 includes iron nitrate, manganese nitrate, copper nitrate, zinc nitrate and aluminium nitrate.
15. The method according to claim 6, wherein the precipitation agent in step 2 is a base.
16. The method according to claim 15, wherein the base is KOH.

17. The method according to claim 6, wherein step 2 is carried out at a pH of 7-9.
18. The method according to claim 17, wherein step 2 is carried out at a pH of 8.
19. The method according to claim 6, wherein step 2 is carried out at a temperature of 50°C - 80°C.
20. The method according to claim 19, wherein step 2 is carried out at a temperature of 68°C - 72°C.
21. The method according to claim 6, wherein the main iron phase of the catalyst composition is ferrihydrite.
22. A method for producing higher olefins selectively, by reacting hydrogen with carbon monoxide in the presence of a catalyst produced in a method according to claim 1.